DOCUMENT RESUME

ED 079 134 SE 016 511

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TITLE Investigating Intricacies of Life Science, Science (Experimental): 5334.02.
INSTITUTION Dade County Public Schools, Miami, Fla.
PUB DATE 72
NOTE 16p.; An Authorized Course of Instruction for the Quinmester Program

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Behavioral Objectives; *Biology; Instruction; Instructional Materials; Objectives; Resource Materials; *Secondary School Science; *Teaching Guides; Units of Study (Subject Fields)
IDENTIFIERS *Quinmester Program

ABSTRACT

This unit of instruction was designed for the student who does not read well or who has been unsuccessful in previously attempted science courses. It is composed of a series of suggested activities selected to give the student a brief experience in many areas of the world of living things. Emphasis is on the study of living things other than Man, and no attempt has been made to develop the topics in depth. The booklet lists the relevant state-adopted texts, suggests other references, and states the performance objectives for the unit. It provides an outline of the course content, makes suggestions for the implementation of the course, and provides a sample work sheet. Fifty-seven student activities are described and related to specific performance objectives, references, and appropriate films available from the Dade County Audiovisual Center. (JR)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

INVESTIGATING INTRICACIES OF LIFE SCIENCE

5334.02

SCIENCE
(Experimental)

SE 016 511

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

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Written by Barbara A. Silver
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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Published by the Dade County School Board

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INVESTIGATING INTRICACIES OF LIFE SCIENCE

COURSE DESCRIPTION

This course is composed of a series of suggested activities selected to give the student a brief experience in many areas of the world of living things. Emphasis is on the study of living things other than man. No attempt has been made to develop each topic in depth. The emphasis has been on including activities thought to be successfully used by the terminal science student.

ENROLLMENT GUIDELINES

This course is designed for the student who does not read well or who has been unsuccessful in previously attempted science courses. The degree of difficulty is very low; required reading should be held to a minimum. This is a course for the terminal science student.

PERFORMANCE OBJECTIVES

The student will:

1. Investigate the formation of a hypothesis.
2. Demonstrate the use and care of both a compound and a stereoscopic microscope.
3. Prepare and observe a wet mount slide.
4. Given the opportunity for class discussion, propose reasons for the use of a classification system.
5. Devise a method for classifying groups of objects.
6. Examine representative specimens from major phyla.
7. Investigate the structure and variety of cells.
8. Describe the structure of some of the following animals:

amoeba	earthworm	perch
paramecium	clam	frog
hydra	daphnia	snake
planaria	grasshopper	chicken
starfish	shark	rat

9. Describe the natural history of selected animals listed above.
10. Relate the structure of the leaf to its function.
11. Relate the structure of the flower to its function.
12. Identify different plants found in this area.

COURSE OUTLINE

I. Scientific Problem Solving

A. Steps in problem solving

B. The microscope as a tool

1. The compound microscope
2. The stereoscopic microscope
3. Preparation of specimens for microscopic study

II. Classification

A. Purpose of classification

B. Biological classification

III. The Cell

A. Cell structure

B. Cell variety

IV. Survey of the Animal Kingdom

A. Amoeba

B. Paramecium

C. Hydra

D. Planaria

E. Starfish

F. Earthworm

G. Clam

H. Daphnia

I. Grasshopper

J. Shark

K. Perch

L. Frog

M. Snake

N. Chicken

O. Rat

V. Plants

A. Structure and function of the leaf

B. Structure and function of the flower

C. Identification of local flora

SUGGESTIONS FOR COURSE IMPLEMENTATION

1. In a course of this type, the ingenuity of the teacher is of the utmost importance. The activities selected are ones thought by the author to work well with slow students. It should be understood that the text references and laboratory references, in most cases, should be considered resources to be adapted for student use. In some cases, more activities have been included than can be used. The teacher should select those best suited for a particular situation.

2. General types of activities such as dissections, microslide viewers, films, film loops, slides, etc. should be interchanged to vary activities.

3. When microslide sets are used, a work sheet may be provided on which the students draw what they see and answer simple questions about the material in the folder that comes with each set. Following this page is a sample work sheet.

4. Some labs may be presented by giving the students a problem and many helpful materials and letting them work out their own procedures.

5. Students like competition—small prizes may be used for motivation (candy bar, donut, free period, etc.)

SAMPLE WORK SHEET

LABORATORY INVESTIGATION NAME_____

PERIOD:_____ DATE:_____

TITLE: The Flower of a Flowering Plant

MATERIALS: Microslide Booklet #80 - The Flower of a Flowering Plant
Microslide viewer

PROCEDURES:
1. Obtain the required materials and read the instructions for use contained inside each booklet.
2. Study each numbered slide carefully and draw what you see. Title each drawing.
3. Answer the questions following each section.

SLIDE ONE

1.

_____

1. How many sepals and petals can you identify in the cross section? Sepals_____; Petals_____.

2. In a corn plant the stamen are in the _____, and the pistils are in the _____.

SLIDE TWO

2.

_____

1. This is a _____ _____ _____ of a stamen compared with the cross section on microslide 1.

2. Each stamen consists of a stalk-like _____ supporting a spore case called the _____.

3. The tiny microspores develop into _____.

SLIDE THREE

3.

1. Each pollen grain develops further and produces _____ _____ or sperm if deposited on a pistil of the proper flower.

2. Two forms of pollination are _____ _____ or ____ _____.

_____

SLIDE FOUR

4.

1. The female part of the flower (pistil) consists of the _____, _____, and _____.

_____

SLIDE FIVE

5.

1. A cross section cut through the ovary of a tomato flower resembles a slice cut from a ripe _____.

2. The little, oval, egg-like structures inside the ovary are called_____.

_____

SLIDE SIX

6.

1. The spore of an ovule matures into a female _____.

2. One of the eight cells in the embryo sac becomes the _____ cell.

_____

SLIDE SEVEN

7.

1. When a pollen grain lands on the pistil of a flower, it _____.

2. The _____ _____ provides the passageway through which the male gametes can reach the female gametes in the embryo sac of the ovule.

_____

SLIDE EIGHT

8.

1. One _____ is united with the egg cell to form an _____ plant.

2. A second sperm unites with two nuclei to develop a supply of food called the _____.

_____

COMPLETE THE FOLLOWING STATEMENTS:

1. Male gametes are produced in the _____.

2. They reach the female gametes by means of the _____ _____.

3. The male and female gamete unite in the _____.

STATE ADOPTED TEXTS AND OTHER REFERENCES

1. Biological Sciences Curriculum Study. Biological Science: Patterns and Processes. New York: Holt, Rinehart and Winston, Inc., 1966.

2. Brandwein, Paul et. al. Life: Its Forms and Changes. New York: Harcourt, Brace and World, Inc., 1968.

*3. Otto, James H., Towle, Albert. Modern Biology. New York: Holt, Rinehart, and Winston, Inc., 1965.

*4. Otto, James H., Towle, Albert, and Crider, Elizabeth M. Biology Investigations. New York: Holt, Rinehart and Winston, Inc., 1968.

5. Oxenhorn, Joseph M. & Idelson, Michael N. Pathways in Science: The Materials of Life. New York: Globe Book Company, 1968.

6. Wong, Harry K., & Dolmatz, Malvin S. Ideas and Investigations in Science - Biology. Englewood Cliffs: Prentice-Hall, Inc., 1971.

7. Biological Sciences Curriculum Study. Biological Science An Inquiry Into Life. 2nd. ed. New York: Harcourt, Brace and World, 1968.

*8. Biological Science Curriculum Study. Student Laboratory Guide, Biological Science: An Inquiry Into Life. 2nd. ed. New York: Harcourt, Brace and World, 1968.

*Not state adopted

ACTIVITIES

Performance Objective 1

1. Black Box Mystery—Teacher should lead the students to discover the steps of scientific problem solving with a discussion of a crime situation. Then provide the students with sealed boxes containing several objects. For example a box might contain a rubber stopper, a pair of scissors and a small culture dish. Students might work in small groups and try to find clues to the contents of the boxes. After recording clues and making a trial hypothesis the box may be opened. Finish with a brief summary of problem solving. Reference #2 - pp. 509-512.

Performance Objective 2

2. Microscope Introduction—Use the film The Microscope (Dade County AV#1-02241, 11' C), to introduce the microscope. Follow this by having the student do Program S-6, pp. 9-14, Reference #1.

3. The World of the Microscope—Students use the microslide viewers and study set #101 and complete a work sheet.

4. Compound Microscope—Use a prepared slide of the letter "e". The prepared slides will give a higher percentage of success in this introductory exercise than having students prepare their own. Present proper techniques for carrying, using, and caring for the microscope. If time permits lead students to discover the direction in which image moves when the slide is moved. Students then examine cotton fibers, hair or other easily viewed objects. Reference #2 - p. 525; #4 pp. 7-10; #8 pp. 3-7.

5. Stereoscopic Microscope—Present the use and care of this microscope. Students examine various materials such as salt crystals, flowers, insects, paper clips etc., and record their observations. Reference #4 - p. 11; #8 - pp. 10 - 12.

Performance Objective 3

6. Preparation of a Wet Mount—Students prepare a wet mount from a piece of colored magazine picture and observe. Then make wet mounts from a culture of pond water organisms. Reference #2 p. 528; #8 pp. 5-7.

7. Observation of Pond Water Organisms—Let samples of pond water stand for about a week. Observe samples under the microscope and sketch what is seen. Descriptions should include any activity observed. This activity may be done weekly for a few weeks if the activity seems to hold the students' interest. Reference #2 - pp. 6-7; #8 pp. 126-127.

Performance Objective 4

8. Purpose of Classifiction—Students should be led to discover that it is useful to classify things. An organized and a mixed up shopping list, a description of a grocery store with no order to it, or a discussion of various ways that books could be arranged in a library will usually accomplish this. Reference #1 p. 3.

Performance Objective 5

9. Classifying Things—Students should do the activity described in section S - 4, p. 7 in Reference #1. As an alternative, pictures of automobiles, various kinds of buttons, or samples of fabrics may be classified by the student.

10. Classification of Organisms—Students should observe a variety of specimens - either living or preserved. After careful observation of similarities and differences they devise a system for classifying the specimens. Discuss the various schemes developed.

Performance Objective 6

11. Biological Classification—Teacher should briefly describe the organization of the biological classification system. Then demonstrate the differences and similarities of living organisms with specimens from the major phyla. The Catalogue of Nature beginning on p. 762 of Reference #2 is excellent. Reference #2 - pp. 338, 372, 294, 419; #3 - pp. 744-754; #7 - pp. 762-819.

12. Insect Classification—After viewing the film Insect Collecting (Dade County AV#1-11155, 14', C), the students collect and identify, by common name, a given number of insects.

Performance Objective 7

13. Observation of Cell Structure—Students use microslide viewers, study set #58, and complete a work sheet.

14. Observation of Cork and Onion Cells—Students prepare and observe this sections of cork and onion cells as described in Reference #4, Lab 4-1, p. 33.

15. Observation of Living Plant Cells—Students do a lab exercise similar to Experiment 3-2, p. 25, Reference #8.

16. Observation of Living Animal Cells—Teacher demonstrates collection of cheek epidermal cells. Then students prepare their own slides and observe. Other slides may be prepared using blood and frog sperm cells. Reference #8 Ex. 3-3.

17. Variety in Cells—Using the microslide viewers, students study set #10 and complete a work sheet.

Performance Objectives 8 and 9

18. Students should view the following Dade County films: The Amoeba (AV#1-12704, 10' BW); Life in a Drop of Water (AV#1-02719, 10' C); and Protozoa (AV#1-02171, 10' BW). Each is a short film and may be followed by a brief discussion of the organisms shown.

19. Pond Life—Using the microslide viewers, students should study set #12 and complete a work sheet.

20. Amoeba—Have students examine live amoeba. Reference #2, p. 313; #4, Lab 18-1, p. 145.

21. Paramecium—Using the microslide viewers, students study set #64 and complete a work sheet.

22. Paramecium—Students study the movement and reactions of living paramecium. Reference #4, Lab 18-1, p.147.

23. Diversity in Protozoans—Use the film loop Animal Life in a Drop of Water, Walt Disney Nature Library #54635. Students may wish to view the loop several times. This should be followed by a review of important characteristics of protozoans.

24. Hydra—Using the microslide viewers, students should study set #76 and complete a work sheet. This activity should be followed by a study of living hydra as described in Lab Investigation 27-2 p. 239, Reference #4, or Reference #2, pp. 317-320.

25. Planaria—First have students study live planaria and then regeneration in planaria. The teacher might prepare some salamanders approximately 6 weeks ahead of time for a demonstration or have some students do this as a long term project. Reference #2, p. 323; #4, pp. 243-247; #8, pp. 178-180.

27. Starfish—Teacher and or students should read aloud pp. 326-332, Reference #2, with frequent pauses for discussion. The following day students should dissect a starfish.

28. Earthworm Study—Students view the film Earthworms, (Dade County AV#1-02734, 10' C). Then read pp. 342-343, Reference #2. Use the questions on p. 348 (Ref. #2) as the basis for a class discussion.

29. Earthworm Dissection—This activity will take 2 to 3 days. Use the largest preserved earthworms available. Reference #2, pp. 344-346; #4, pp. 251-256.

30. Clam—The students should study p. 349, Reference #2. Then a clam dissection may be done either as a teacher demonstration or by the students. Reference #2, pp. 349-351; #4, pp. 257-259.

31. Clam—Tnis activity may be used to introduce the mollusks or to review. Students view the film loop Mollusks (Ealing 81-6737).

32. Daphnia Study—Have students work in teams on the "Investigation into the Structure of Daphnia", p. 366 Reference #2.

33. Daphnia Heartbeat—This activity should be done by teams of several students. Many students may participate as time keepers, recorders, counters etc. Reference #8, Inquiry 21-1, pp. 152-154.

34. Insect Study—Students view the following Dade County films: Insects (AV#1-02760, 11', C); Insect Life Cycle (AV#1-02787, 11', BW) Insects are Interesting (AV#1-03720, 11', C).

35. Grasshopper Study—Use the film The Grasshopper a Typical Insect (Dade County AV#1-02750, 6', C) to introduce this animal. Then students should study Reference #2 pp. 354-356, in preparation for a laboratory study of a grasshopper.

36. Grasshopper Dissection—The dissection will probably take 2 periods. Reference #2 pp. 356-360; #4 pp. 267-268.

37. Other Arthropods—Students should view the following Dade County films: Arachnids (AV#1-02740, 10', BW); Spider Engineers (AV# 1-11151, 12', C). Have the students write a comparison between the characteristics of insects and arachnids.

38. Shark Study—Find a good "shark story" and read it aloud to the class. Then show the Life Film Strip Sharks. This may take 2 or more periods as it generally generates some discussion. Encourage students to bring in material on this subject.

39. Bony Fish Dissection—Students view the Dade County film Fish and Their Characteristics (AV#1-02831, 11', C). Follow the film with the students doing a fish dissection and a demonstration of how a swim bladder works. This will take several days. Reference #2, pp. 377-385; #4, pp. 269-274.

40. Frog Development—Students use microslide viewers, study set #16, and complete a worksheet.

41. Frog Dissection—Teacher should first demonstrate procedure. Then students will probably need one day on the external anatomy and at least two more on the internal anatomy. Reference #2, pp. 96-102; #4, pp. 277-284.

42. Frog Anatomy—Use the Dade County film Frog Anatomy (AV#1-11182, 17', C) either before the dissection or after.

43. From Water to Land—Discuss the movement of amphibians to land and the characteristics that made the move possible. Then discuss the evolution of reptiles and birds. Students complete a work sheet on which they list the characteristics of these three groups. Reference #2, 386-404; #3, Ch 35, 36, and 37.

44. Snakes—Students view the Motivational Biology Program, Snakes are Cool.

45. Bird Study—Students view the Dade County film Water Birds (AV# 1-30705, 32', C)

46. Chicken—Students make a study of the anatomy of a chicken. This probably is best handled as a dry lab. Reference #2, pp. 403-408.

47. Chick Development—Students view the following Dade County films: Eggs To Chickens (AV#1-03873, 10', C); Development of the Chick Embryo (AV#1-03872, 5', C).

48. Chick Development—Using the microslide viewers, the students study set #17 and complete a work sheet.

49. Chick Development—Follow the procedure on pp. 156-162, Reference #1. The eggs can be placed in the incubator at different times if time is short. Be sure to plan to let a few chicks hatch. Reference #1, pp. 156-162; #2, pp. 454-456.

50. Anatomy of a Rat—Characteristics of mammals should be discussed. Follow this with either a student dissection or a demonstration of the dissection of a rat or mouse. Reference #2, pp. 410-417; #3, Chapter 38.

Performance Objective 10

51. Leaf Structure—Using the microslide viewers, students study set #79, and complete a work sheet.

52. Leaf Structure—The students should be given a prepared slide of a cross section of a leaf and also given materials to make a fresh slide. Use a procedure similar to Inquiry 15-2, Reference #8, pp. 97-98.

53. Leaf Function—Follow the procedure given in Inquiry 15-6, Reference #8, pp. 102-103.

Performance Objective 11

54. Using the microslide viewers, students study set #80, and complete a work sheet.

55. Flower Structure and Function—Students should study pp. 291-296 in Reference #2. Follow with a discussion.

56. Flower Structure—Students dissect fresh flowers. References #2, pp. 291-292; #4, p. 223; #8, p. 110.

Performance Objective 12

57. Students collect and identify, by common name, 10 different leaf specimens. Then compare collections as well as discuss different environments from which they may have come.